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## ENTOMOLOGY.

Kraepelin on the Organs of Smell in Arthropods.[1]—To Leydig it was first given to make a decided step in advance. In different writings[2] had this naturalist busied himself with the integumental structures of Arthropods, and declared Erichson's view as to the olfactory nature of the antennal pits as the truest, before he, in his careful work on the olfactory and auditory organs of crabs and insects (14), gave excellent representations of the numerous anatomical details which he had selected from his extensive researches in all groups of Arthropods. Besides the pits which were found to exist in Crustacea, Scolopendræ, beetles, Hymenoptera, Diptera, Orthoptera, Neuroptera and Hemiptera, and which had only thus far been regarded as sense-organs, Leydig first calls attention to the widely-distributed pegs and teeth, also considering them as sense-organs. "Olfactory teeth," occurring as pale pegs, perforated at the end, on the surface of the antennæ of Crustacea,[3] Myriopoda, Hymenoptera, Lepidoptera, Coleoptera, are easily distinguished, and besides the "olfactory pegs" of the palpi, may be claimed as organs of smell. The nerve-end apparatus first discovered by Hicks in the halteres and wings, Leydig thinks should be ranked as organs of hearing.

Regarding the Crustacea, Leydig, in his latest work,[4] gave a lasting explanation of the nature of the pale peg or cylinder on the end of the antennæ which he found in new groups of this class, which was adopted by a large number of naturalists. Thus Claus,[5] in his different essays, expressed the view that these Leydigian organs had the function "of making sensible slight changes in the chemico-physical condition of the water." Indeed, in his later essays[6] he without hesitation calls the structures in question "olfactory teeth," while he at the same time offers a series of anatomical data on the finer structure of the same. Entirely in the same direction do Sars,[1] Weismann,[2] Rougemont,[3] Gamroth,[4] Hoek,[5] Haller[6] and others more or less decide upon the olfactory nature of the organ of Leydig.

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[1] Translated by A. S. Packard. Concluded from p. 894.

[2] *Leydig:* Zum feineren Bau der Arthropoden, Müller's Archiv, 1855, 376–480; Zur Anatomie der Insekten, Archiv für Anatomie, 1859, pp. 35–89 and 149–183; Lehrbuch der Histologie, 1857, 220.

[3] These pegs, as occurring in Asellus and Daphnidæ, had already been well described, in 1860, in his monograph "Naturgeschichte der Daphiden," Tübingen, 1860, without, however, a discussion of the question whether they were olfactory organs.

[4] *Leydig:* Ueber Amphipoden und Isopoden, Zeits. f. w. Zoologie, xxx, 1878, 225–274.

[5] *Claus:* Ueber die Organization und Verwandtschaft der Copepoden, Würzburg, 1862, 19; Die freilebenden Copepoden, Leipzig, 1863, 55.

[6] *Claus:* Entwicklung, Organization und Systemat. Stellung der Arguliden. Zeit. f. w. Zool., 1875. Zur Kenntniss der Organization und des feineren Baues der Daphniden, etc. Zeits. f. w. Zool., 1876. Zur Kenntniss des Baues, und der Organization der Polyphemiden. Denkschr. d. Wiener Akad. wiss. Math. Naturw. Classe, 1877, xxxvii, 245. Der Organismus der Phronimiden, Wien, 1879, 10.

Jourdain (40) does not accept this opinion, and Wrzésniowski[7] adopted the views of Milne-Edward and La Valette. The "calceoli" of Amphipoda might be regarded as organs of smell.

There was still some opposition to Leydig's opinion that in the insects the sense of smell is localized in the antennæ (teeth and pits), and here the work of Hensen[8] might be mentioned, which in 1860 had a decided influence upon the conclusion of some inquiries.

Thus Landois (15) denied that the antennæ had the sense of smell, and declared that the pits in the antennæ of the stag beetle were auditory organs. In like manner Paasch (16) rejected Leydig's conclusion, while he sought to again reinstate the old opinion of Rosenthal as to the olfactory nature of the frontal cavity of the Diptera. In spite of the exact observations and interesting anatomical discoveries of Forel[9] in ants, made in 1874, there appeared the great work of Wolff on the olfactory organs of bees, in which this observer, with much skill and acuteness, sought to give a basis for the hypothesis of Kirby and Spence that the seat of the sense of smell lay in the soft palatine skin of the labrum within the mouth. Joseph (18), two years later, drew attention to the stigmata as olfactory organs, referring to the olfactory girdle, and Forel[10] sought by an occasional criticism of Wolff's conclusions to prove experimentally the olfactory function of the antennæ; but Graber,[11] in his much-read book on insects, defended the Wolffian "nose" in the most determined way, and denied to the antennæ their so often vindicated faculty of smell. In 1879 Berté (52) thought he had observed in the antenna of the flea a distinct auditory organ, and Lubbock[12] considered the organs of

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[1] *Sars:* Histoire naturelle des Crustacés d'eau douce de Norvège, Christiania, 1867.

[2] *Weismann:* Ueber den Bau und der Lebenserscheinungen der Leptodora hyalina, Zeits. f. w. Zool., XXIV.

[3] *Rougemont:* Naturgeschichte des Gammarus puteanus, München, 1875, 9.

[4] *Gamroth:* Beiträge zur Kenntniss der Naturgeschichte der Caprellen, Zeits. f. w. Zool., XXXI, 1878.

[5] *Hoek:* Carcinologisches in Tydschr. d. Md. Dierk. Vereen. Deel, IV, 102.

[6] *Haller:* Der Læmadipodes filiformes, Zeits. f. w. Zool., XXXIII, 1880, 368.

[7] *Wrzésniowski:* Vorl. Mittheilung über einige Amphipoden. Zool. Anzeiger, 466, 1879.

[8] *Hensen:* Das Gehörorgan der Decapoden. Zeits. f. w. Zool. XIII, 1863. Das Gehörorgan von Locusta. Zeits. f. w. Zool. XVI, 1886.

[9] *Forel:* Les Fourmis de la Suisse. Neue Denkschr. Allg. Schweiz. Gesellsch. f. d. ges. Naturw. XXVI, 1874. 118, 144.

[10] *Forel:* Der Giftapparat u. d. Anal-drüsen der Ameisen. Zeits. f. w. Zool. XXX. Suppl. 60.

[11] *Graber:* Die Insekten, München, 1877.

[12] *Lubbock:* On some points in the anatomy of ants. Monthly Micr. Journ., 1887, 121–142.

Forel in the antennæ of ants as a "microscopic stethoscope." In 1879 Graber described a new otocyst-like sense-organ in the antennæ of flies (20) which was accompanied by a complete list of all the conceivable forms of auditory organs in Arthropods. In this work Graber described in Musca and other Diptera closed otocysts with otoliths and auditory hairs, as Lespè had previously done. But Paul Mayer, in two essays (21, 53) refuted this view in a criticism of the opinion of Berté, referring the "otocysts with otoliths" to the well-known antennal pits into which tracheæ might pass. Mayer did not decide on the function of the hairs which extend to the bottom of the pits; while in the most recent research, that of Hauser (22), the author again energetically contended for the olfactory function of the antennæ. Both through physiological experiments and detailed anatomical investigations Hauser sought to prove his hypothesis as Pierret, Erichson, Slater, and others had done before him, besides working from a Darwinian point of view. In a purely anatomical aspect, especially prominent are his discovery of the singularly formed nerve-rods in the pits and peg-like teeth of the Hymenoptera and their development, as well as the assertion that numerous hairs in the pits described by Leydig, Meyer, etc., should be considered as direct terminations of nervous fibers passing into the pits. In the pits he farther, with Erichson, notices a serous fluid, which may serve as a medium for the perception of smells. Among the latest articles on this subject are those of Künckel and Gazagnaire (41) which are entire anatomical, while the latest treatise of Graber on the organs of hearing in insects[1] opposes Hick's theory of the olfactory function of the nerve-end apparatus in the halters, wings, etc., and argues for the auditory nature of these structures. Finally, experimental researches by Voges on the seat of the olfactory organs are only known to the writer by a notice in the "Täglichen Rundschau."[2] According to this observer the sense of smell is not localized, but spread over the whole body.

COXAL GLANDS IN SPIDERS AND PERHAPS INSECTS.—Professor P. Bertkau reports that in a specimen of Atypus he has been able to find a distinct efferent duct for the coxal gland; it is surrounded by the same fibrous plexus as the gland itself; in six other specimens the duct was not to be found, though the orifice was seen. This rare phenomenon may either be explained by supposing that there was an abnormal retention of an organ which is in other cases absorbed, or, it may be suggested, that in adult examples the efferent duct is regenerated from time to time, in which case the coxal gland would not be a rudimentary organ, but one that is intermittently functional; the constant presence of the orifice is an argument in favor of the latter hypothesis. It

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[1] *Graber:* Ueber die Chordotonalen Sinnesorgane der Insekten. Archiv. f. mikrosk. Anat. XX, 506–640. XXI, 65–145, 1881, 1882.

[2] Tägliche Rundschau. Zeitung für Nichtpolitiker, 1882, September (?).

is important to note that the orifice appears on two segments, for this indicates a repetition of the glandular organ, and is *pro tanto* a support to the view of Ray Lankester, that the coxal glands of Arachnids and of Limulus, are the homologues of the segmental organs of Peripatus. The author suggests that the gland at the sides of the prothorax of *Anisomorphus buprestoides*, and those found by Scudder in the Phasmidæ, are possibly representatives of the same gland. In *Mantis religiosa* there is a coiled gland at the hinder side of the fore leg.—*Journ. Roy. Micr. Soc., June, 1886.*

HEART OF INSECTS.—Miss Olga Poletajura finds that the heart of Bombus is composed of five separate tubes, which form the chambers of the organ, and that the most anterior of these is continued into the aorta. Each tube narrows anteriorly so as to have the appearance of a truncated cone, while the walls become thinner; posteriorly it enlarges; the anterior end passes into the posterior in front, and each anterior end is so flattened laterally as to form a vertical cleft; the cardiac tubes are thus only united with one another at two points; the free portion forms a duct (ostium) by which the blood from the abdomen enters the heart; the internal surface of the anterior tube, and the external surface of the posterior form pouch-like safety-valves which regulate the movement of the blood. The heart of Cimbex is formed in essentially the same way as that of Bombus. The writer points out the differences between the accounts now given and those of such entomologists as Strauss, Newport, and Graber, and describes the mode by which the heart appears to perform its function; contrary to the opinion of Strauss, the first chamber does not function alone, as the propelling agent and the ostia are not perfectly closed, so that part of the blood does return to the abdominal cavity.—*Zool. Anzeig., ix (1886), pp. 13-5.*

MIGRATIONS OF THE AJAX BUTTERFLY.—During the fore part of June, 1886, unusual numbers of the Ajax butterfly *(Papilio ajax)* migrated through this city. Since the only feeding places accessible to them in Chicago at this point are scattered lots where a few bunches of clover or dandelion make up the principal flowering plants, the butterflies made few if any stops at these, but flew along the streets near the ground at a rapid rate northward, and it was with considerable difficulty that a single specimen was secured. On June 12th a visit was made at Wood Lawn, Ill., a few miles south of Chicago, where the butterflies were found quite as plentiful, and showed the same uneasiness in their flight. In a cleared grassy spot in the woods near at hand, white clover had spread its blossoms in broad patches where occasionally a butterfly would make a hasty stop, which, however, was only for a moment, when its form would again be seen disappearing through the woods. One of these specimens, after many futile attempts was caught, but was badly spoiled and thrown away, which, by mere chance, fell on the ground with its wings extended. A few minutes later it was noticed that the insects that flew by were sensibly attracted by this dead insect, which they endeavored to make known by their occasionally alighting directly upon the dead body of their fellow.

Thus noticing the decoying effects of the insect, a number after being chloroformed were set apart as decoys pinned upon the ends of twigs which were stuck in the ground. The effect was quite remarkable; hardly a single butterfly would pass the sight without alighting among them, and-became an easy prey to the net. In this way a large number of beautiful specimens were taken which would otherwise have been quite difficult to capture. —*Joseph L. Hancock.*

ENTOMOLOGICAL NOTES.—At the June meeting of the Entomological Society of Washington, Mr. Lugger mentioned the fact that the seeds of the hard maple, so numerous in the Smithsonian grounds, were this year uniformly sterile. He attributed this phenomenon to the inclement weather during the flowering season, which prevented bees from visiting the flowers. He also farther described the mode of fertilization of the common lady's-slipper (*Cypripedium acaule*) by a species of Andrena.—— Mr. Lugger also remarked that a few specimens of the European *Aphodius erraticus* were first found by him in 1878 near Baltimore. Since that time the species has spread and is now so common that it has actually replaced the formerly common *Aphodius fimetarius.*——Mr. J. B. Smith describes and figures, in Entomologia Americana (No. 4), the scent-organs of *Leucarctia acræa* and *Pyrrarctia isabella*, which are thrust out between the 7th and 8th segments of the abdomen of those moths. Similar organs have been observed by Morrison in *Agrotis plecta* and *Euplexia lucipara*, and Dr. Riley has observed them in *Aletia xylina.*

## ZOÖLOGY.

CLASSIFICATION OF SPONGES.—Professor W. J. Sollas (Scientif. Proc. Roy. Dublin Socy., v. 1886) thus arranges the sponges:

- Class I. Plethospongiæ.
  - Sub-class I. Hexactinellida.
  - Sub-class II. Desmospongiæ.
  - Sub-class III. Myxospongiæ.
- Class II. Calcispongiæ.

The great majority of the sponges, as will be seen, belong to the Desmospongiæ. The Myxospongiæ are not regarded as a degenerate group. Sollas resents (Zool. Anzeiger, 1886) the imputation of Heider that his peculiar gastrulas of sponges were merely shriveled blastulæ.